WHAT IS CLAIMED IS:

1. A method for generating (2^k-2^t) first order Reed-Muller codes from 2^k first order Reed-Muller codes based on k input information bits, comprising the steps of:

selecting t linearly independent k^{th} order vectors;

generating 2^t linear combinations by linearly combining the t selected vectors;

calculating 2^t puncturing positions corresponding to the 2^t linear combinations; and

generating (2^k-2^t) first order Reed-Muller codes by puncturing the 2^t puncturing positions from the 2^k first order Reed-Muller codes.

2. The method as claimed in claim 1, wherein the linearly independent k^{th} order vectors satisfy a linear independent property represented by,

$$v^0, v^1, .., v^{t-1}: \text{ linear independent property}$$
$$\Leftrightarrow c_{t-1}v^{t-1} + \cdots + c_1 v^1 + c_0 v^0 \neq 0, \quad \forall c_0, c_1, \ldots, c_{t-1}$$

3. The method as claimed in claim 1, wherein the 2^t linear combinations are,

$$c^i = (c^i_{k-1}, \ldots, c^i_1, c^i_0)$$

where i indicates an index for the number of the linear combinations.

4. The method as claimed in claim 1, wherein the 2^t puncturing positions are calculated by converting the 2^t linear combinations to decimal numbers.

5. The method as claimed in claim 3, wherein the 2^t puncturing

positions are calculated by applying the 2^t linear combinations to an equation given below:

$$P_t = \sum_{j=0}^{k-1} c_j^i 2^t \qquad t = 1,\ldots,2^t$$

6. The method as claimed in claim 1, wherein the 2^k first order Reed-Muller codes are codes for encoding the k input information bits.

7. The method as claimed in claim 1, wherein the 2^k first order Reed-Muller codes are a coded symbol stream obtained by encoding the k input information bits with a given code.

8. A method for generating (2^k-2^t) first order Reed-Muller codes from 2^k first order Reed-Muller codes based on k input information bits, comprising the steps of:

selecting t linearly independent k^{th} order vectors;

generating 2^t linear combinations by linearly combining the t selected vectors;

calculating 2^t puncturing positions corresponding to the 2^t linear combinations;

selecting one k×k matrix out of a plurality of k×k matrixes having k×k inverse matrixes;

calculating 2^t new puncturing positions by multiplying each of the 2^t puncturing positions by the selected k×k matrix; and

generating (2^k-2^t) first order Reed-Muller codes by puncturing the 2^t new puncturing positions from the 2^k first order Reed-Muller codes.

9. The method as claimed in claim 8, wherein the linearly independent k^{th} order vectors satisfy a linear independent property represented

by,

$$v^0, v^1, .., v^{t-1}: \text{ linear independent property}$$
$$\Leftrightarrow c_{t-1}v^{t-1} + \cdots + c_1 v^1 + c_0 v^0 \neq 0, \quad \forall c_0, c_1, \ldots, c_{t-1}$$

10. The method as claimed in claim 8, wherein the 2^t linear combinations are,

$$c^i = (c^i_{k-1}, \ldots, c^i_1, c^i_0)$$

where i indicates an index for the number of the linear combinations.

11. The method as claimed in claim 10, wherein the 2^t puncturing positions are calculated by converting the 2^t linear combinations to decimal numbers.

12. The method as claimed in claim 8, wherein the 2^t puncturing positions are calculated by applying the 2^t linear combinations to an equation given below:

$$P_i = \sum_{j=0}^{k-1} c^i_j 2^j \qquad i = 1, \ldots, 2^t$$

13. The method as claimed in claim 8, wherein the 2^k first order Reed-Muller codes are codes for encoding the k input information bits.

14. The method as claimed in claim 8, wherein the 2^k first order Reed-Muller codes are a coded symbol stream obtained by encoding the k input information bits with a given code.

15. The method as claimed in claim 8, wherein the selected k×k matrix A is given as follows:

$$A=\begin{bmatrix} 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

16. An apparatus for encoding k input information bits in a transmitter for a CDMA (Code Division Multiple Access) mobile communication system, comprising:

an encoder for encoding the k input information bits with 2^k–bit first order Reed-Muller codes, and outputting 2^k coded symbols; and

a puncturer for selecting t linearly independent k^{th} order vectors, puncturing coded symbols in puncturing positions corresponding to 2^t linear combinations, obtained by linearly combining the t selected vectors, from the 2^k coded symbols, and outputting (2^k-2^t) coded symbols.

17. The apparatus as claimed in claim 16, wherein the linearly independent k^{th} order vectors satisfy a linear independent property represented by,

$$v^0, v^1, .., v^{t-1}: \text{ linear independent property}$$
$$\Leftrightarrow c_{t-1}v^{t-1} + \cdots + c_1 v^1 + c_0 v^0 \neq 0, \quad \forall c_0, c_1, \ldots, c_{t-1}$$

18. The apparatus as claimed in claim 16, wherein the 2^t linear combinations are,

$$c^i = (c^i_{k-1}, \ldots, c^i_1, c^i_0)$$

where i indicates an index for the number of the linear combinations.

19. The apparatus as claimed in claim 16, wherein the 2^t puncturing positions are calculated by converting the 2^t linear combinations to decimal numbers.

20. The apparatus as claimed in claim 18, wherein the 2^t puncturing positions are calculated by applying the 2^t linear combinations to an equation given below:

$$P_i = \sum_{j=0}^{k-1} c_j^i 2^i \qquad t = 1,\ldots,2^t$$

21. An apparatus for encoding k input information bits in a transmitter for a CDMA mobile communication system, comprising:

a code generator for selecting t linearly independent k^{th} order vectors, puncturing 2^k-bit first order Reed-Muller code bits corresponding to 2^t linear combinations obtained by linearly combining the t selected vectors from the 2^k-bit first order Reed-Muller codes, and outputting $(2^k\text{-}2^t)$-bit first order Reed-Muller codes; and

an encoder for encoding the k input information bits with the $(2^k\text{-}2^t)$-bit first order Reed-Muller codes, and outputting $(2^k\text{-}2^t)$ coded symbols.

22. The apparatus as claimed in claim 21, wherein the linearly independent k^{th} order vectors satisfy a linear independent property represented by,

$$v^0, v^1, \ldots, v^{t-1}: \text{ linear independent property}$$
$$\Leftrightarrow c_{t-1}v^{t-1} + \cdots + c_1 v^1 + c_0 v^0 \neq 0, \quad \forall c_0, c_1, \ldots, c_{t-1}$$

23. The apparatus as claimed in claim 21, wherein the 2^t linear combinations are,

$$c^i = (c_{k-1}^i, \ldots, c_1^i, c_0^i)$$

where i indicates an index for the number of the linear combinations.

24. The apparatus as claimed in claim 21, wherein the 2^t puncturing

positions are calculated by converting the 2^t linear combinations to decimal numbers.

25. The apparatus as claimed in claim 23, wherein the 2^t puncturing positions are calculated by applying the 2^t linear combinations to an equation given below:

$$P_i = \sum_{j=0}^{k-1} c_j^i 2^j \qquad i = 1,\ldots,2^t$$

26. The apparatus as claimed in claim 21, wherein the encoder comprises:

k multipliers each for multiplying one input information bit out of the k input information bits by one (2^k-2^t)-bit first order Reed-Muller code out of the (2^k-2^t)-bit first order Reed-Muller codes, and outputting a coded symbols stream comprised of (2^k-2^t) coded symbols; and

a summer for summing up the coded symbol streams output from each of the k multipliers in a symbol unit, and outputting one coded symbol stream comprised of (2^k-2^t) coded symbols.

27. A method for receiving (2^k-2^t) coded symbols from a transmitter and decoding k information bits from the (2^k-2^t) received coded symbols, comprising the steps of:

selecting t linearly independent k^{th} order vectors, and calculating positions corresponding to 2^t linear combinations obtained by combining the t selected vectors;

outputting 2^k coded symbols by inserting zero (0) bits in the calculated positions of the (2^k-2^t) coded symbols;

calculating reliabilities of respective first order Reed-Muller codes comprised of the 2^k coded symbols and 2^k bits used by the transmitter; and

decoding the k information bits from the 2^k coded symbols with a first

order Reed-Muller code having the highest reliability.

28. The method as claimed in claim 27, wherein the linearly independent k^{th} order vectors satisfy a linear independent property represented by,

$$v^0, v^1, .., v^{t-1}: \text{ linear independent property}$$
$$\Leftrightarrow c_{t-1}v^{t-1} + \cdots + c_1v^1 + c_0v^0 \neq 0, \quad \forall c_0, c_1, \ldots, c_{t-1}$$

29. The method as claimed in claim 27, wherein the 2^t linear combinations are,

$$c^i = (c^i_{k-1}, \ldots, c^i_1, c^i_0)$$

where i indicates an index for the number of the linear combinations.

30. The method as claimed in claim 27, wherein the 2^t puncturing positions are calculated by converting the 2^t linear combinations to decimal numbers.

31. The method as claimed in claim 29, wherein the 2^t puncturing positions are calculated by applying the 2^t linear combinations to an equation given below:

$$P_i = \sum_{j=0}^{k-1} c^i_j 2^t \qquad t = 1, \ldots, 2^t$$

32. An apparatus for receiving (2^k-2^t) coded symbols from a transmitter and decoding k information bits from the (2^k-2^t) received coded symbols, comprising:

a zero inserter for selecting t linearly independent k^{th} order vectors, calculating positions corresponding to 2^t linear combinations obtained by combining the t selected vectors, and outputting 2^k coded symbols by inserting

zero (0) bits in the calculated positions of the (2^k-2^t) coded symbols;

an inverse fast Hadamard transform part for calculating reliabilities of respective first order Reed-Muller codes comprised of the 2^k coded symbols and 2^k bits used by the transmitter, and decoding the k information bits from the 2^k coded symbols with the first order Reed-Muller codes corresponding to the respective reliabilities; and

a comparator for receiving in pairs the reliabilities and the information bits from the inverse fast Hadamard transform part, comparing the reliabilities, and outputting information bits pairing with the highest reliability.